07/15/2003

Viability Assessment Report
For
White Pine - Hemlock Habitat Association

Prepared by
Pamela J. Martin
Daniel Boone National Forest

I. Description of Habitat Association

The White Pine-Hemlock Habitat Association occurs on mesic to somewhat dry sites over a broad range of topographic conditions including ravines, valley flats, sheltered low ridges, open north-facing slopes at high elevations, and steep exposed slopes. This association includes forest dominated by hemlock and white pine, singly or mixtures of both and associated hardwood species. Hemlock may be the dominate species in forested ravines and flats along streams at low to intermediate elevations, and at higher elevations on open north-facing slopes. White pine may share dominance in the low to intermediate elevation forests. Hemlock is also associated with mesophytic hardwoods. Water on these sites is primarily from surface sources (rainfall). On some sites, limited amounts of ground water help maintain suitable moist conditions. Sunlight, which drives photosynthesis, is the major source of energy. Fire has historically had little impact on eastern hemlock. However, decay of vegetation and byproducts of fires passing through the White Pine-Hemlock Habitat Association does provide energy sources. Pit and mound microtopography is also characteristic of this habitat association. Currently, the hemlock wooly adelgid, an exotic insect is causing widespread mortality among eastern hemlocks. This infestation is not currently a forest health problem on the Daniel Boone National Forest (USDA Forest Service, 1997).

The Daniel Boone National Forest (DBNF) occurs in three ecological sections: Northern Cumberland Plateau, Interior Low Plateau and Highland Rim and Cumberland Mountains. The White Pine-Hemlock Habitat Association occurs in all three of these ecological sections.

In the Northern Cumberland Plateau of the DBNF, white pine-hemlock habitat occurs in the following landtype associations (LTAs) (USDA Forest Service, 1997a; 1996):

- Northern Escarpment (221Hb004)
- Northern Low Hills/Cliff Transition (221Hb005)
- Northern Rolling Hills (221He003)
- North Fork Kentucky Cliffs (221Hb003)
- Central Cliff (221Hb002)
- London-Corbin Plain Transition (221Hc007)

- Rolling Low Hills (221He001)
- Low Hills (221He002)
- Low Hills-Rugged Hills Transition (221Ha002)
- Southern Middle Breathitt Rugged Hills (221Ha001)
- London-Corbin Plain (221Hc006)
- Rockcastle Hills (221Hc005)
- Southern Cliff (221Hc003)
- Big South Fork Plateau (221Hc004).

On the DBNF, Interior Low Plateau and Highland Rim, white pine-hemlock habitat occurs in the following LTAs (USDA Forest Service, 1997a; 1996):

- Triplett Creek Knobs (222En002)
- Knob Flats (222En001).

In the Cumberland Mountain ecological section, of the DBNF, white pine-hemlock habitat occurs in the following LTA (USDA Forest Service, 1997a; 1996):

- Northern Jellico Mountains (M221Cd001).

On the DBNF, the white pine-hemlock forest type is concentrated on steep colluvial slopes with Jefferson soils derived from sandstone, mostly in narrow ravines or on lower north-facing slopes. In addition to the dominant hemlock, other characteristic trees include white pine, birches, magnolias and American holly, most of which are more common in transitional or disturbed phases. White pine is often co-dominant in the canopy, but rare in the understory. The dominant shrub is typically rhododendron; mountain pepperbush and buffalo nut are also frequent. The herbaceous layer is usually sparse, however, the most abundant herbaceous species include New York fern, sweet white violet, and partridge berry. Other characteristic associates include shining clubmoss, rockcap fern, and Indian cucumber root. Species that can be observed in the transition to beech-yellow-poplar or sugar maple include foamflower and meehania. Other species typical of the transition zone include, black cohosh, hepatica, spring beauty, slender toothwort, goldenrod, yellow mandarin, erect trillium and crested dwarf iris (USDA Forest Service, 1989).

II. Current Status of the Habitat Association on the Daniel Boone National Forest

The white pine and hemlock forest types on the DBNF are tracked in the Continuous Inventory of Stand Conditions (CISC) and are represented as white pine (03), white pine - hemlock (04), and hemlock (05). The management codes in this forest type, white pine-hemlock, are defined as follows (USDA Forest Service, 1992):

(03) =70+ percent of the dominant and co-dominant basal area (BA) is softwood, and white pine is the predominant softwood;

(04)= 70+ percent of the dominant and co-dominant BA is softwood, and white pine and hemlock each have at least 10 BA, and together are the predominant softwoods; and

(05)= 70+ percent of the dominant and co-dominant BA is softwood, and hemlock is predominant (and the stand contains greater than 10 BA of white pine).

The CISC database was queried to determine occurrence of these forest types on the landscape. The Daniel Boone National Forest has approximately 665,000 acres of forested land. Of this acreage, approximately 1 percent or 9,312 acres are within the white pine-hemlock forest type as described. Table 1 shows the forest types of white pine-hemlock habitat on the DBNF separated by age class (USDA Forest Service, 1998).

Table 1. Forest types within the White Pine–Hemlock Habitat Association by age and acres.

AGE	WHITE PINE (03) ACRES	WHITE PINE-HEMLOCK (04)	HEMLOCK (05) ACRES
0-10	818	0	0
11-20	2203	0	0
21-30	1673	44	86
31-40	1281	0	216
41-50	231	33	122
51-60	61	0	45
61-70	73	36	38
71-80	269	24	109
81-90	43	0	117
91-100	0	209	103
101-110	225	47	325
111-120	0	0	373
121-130	0	0	62
131-140	0	0	189
141-150+	0	0	257
TOTAL	6877	393	2042

III. Management Needs: Recommendations for the Conservation of Habitat to Ensure Species Viability

The desired future condition for this habitat association would be to provide amounts of suitable habitat in the proper stages of succession to ensure that the species dependant on the association have a high probability of persistence on the forest. This would involve maintaining a structured age class distribution with emphasis on maintaining a large component of habitat that contains the habitat modifiers required by various species.

- Evaluate habitats to determine those capable of supporting reintroduction of species at risk.

    - *Ratonale: Specific species management within this habitat association may require reintroduction efforts to ensure continued persistence of that particular species or group of species in this association.*

- White pine-hemlock needs to be represented in a range of age classes.

    - *Rationale: White pine-hemlock makes up approximately 1 percent of the forest type on the DBNF. The species identified in this habitat association require a variety of age classes, elevations and tract sizes. Species from the wood thrush, which requires a minimum tract size of 3 hectares (7.43 acres) to the Acadian flycatcher, which prefers forested tract sizes of 37 hectares (91.4 acres) of mesophytic cove habitats greater than 80 years old. A range of age classes, along with their accompanying attributes, is a necessary component of this habitat association. It is presumed that with a range of age classes, specifically older age stands and their attributes, i.e. decorticated logs which are utilized by Nowellis curvifolia, the species identified in this habitat association will continue to persist on the forest.*

- Where applicable, leave project unit boundaries with irregular and feathered edges

    - *Rationale: Abrupt habitat changes can create barriers to wildlife passing through the unit.*

IV. Management Needs: Monitoring and Inventory to Ensure Species Viability

Monitoring and inventory of the White Pine-Hemlock Habitat Association will need to be implemented at a level sufficient to provide data to track the current condition of the habitat. The following items are considered necessary to ensure that the association can be properly evaluated and decisions supported.

- Inventory should be conducted in each stand (or analysis unit) at least once every 10 years. Stand (or analysis unit) inventory should also be conducted in response to events that have potential to alter the landscape i.e., windstorms, winter storms, insect and disease infestations (high priority).

    - *Rationale: Inventory to identify and update baseline data or assess changed conditions after non-prescribed major disturbances. Inventory may be at the stand level or larger units may be used (such as ecological or habitat units) as long as the data is sufficient to assess the required parameters. Current data from past inventory work may need to be supplemented to include additional habitat modifier data. This inventory may be part of the prescription process but should not be limited to project planning efforts.*

- Employ GIS and vegetation management databases to track the condition and composition of the White Pine-Hemlock Habitat Association (high priority).

- *Rationale: The use of FSVeg (CISC or best available science) in concert with our GIS coverage of stands should be adequate to assess the composition, age class and spatial distribution of the pine habitat and habitat modifiers. This makes the assumption that the inventory data collects the necessary information regarding habitat modifiers.*

- Continue to implement R8 landbird monitoring program (high priority).

  - *Rationale: This monitoring program will help track the persistence of the avian species in this habitat association. This may be a critical element in documenting avian species trends in this association.*

References:

USDA Forest Service. 1996. Landtype association GIS coverage. U.S. Department of Agriculture, Forest Service, Daniel Boone National Forest. Winchester, KY. Accessed August 2001.

USDA Forest Service. 1997.Guidance for Conserving and Restoring Old-Growth Forest Communities on National Forests in the Southern Region: report of the Region 8 Old-Growth Team. Forestry Report R8-FR 62. U.S. Department of Agriculture, Forest Service, Southern Region, Atlanta, GA.117p.

USDA Forest Service. 1997a. Landtype association map unit descriptions. Unpublished white paper. U.S. Department of Agriculture, Forest Service, Daniel Boone National Forest. Winchester, KY.

USDA Forest Service. 1998. Continuous inventory of stand condition (CISC). Unpublished data. U.S. Department of Agriculture, Forest Service, Daniel Boone National Forest. Winchester, KY.

USDA Forest Service, The Nature Conservancy, Kentucky State Nature Preserves Commission, Kentucky Department of Fish and Wildlife Resources. 1989. Cooperative inventory of endangered, threatened, sensitive and rare species, Daniel Boone National Forest, Stanton Ranger District. Winchester, KY. 316 pp.

Attachment A.

Species List: White-Pine Hemlock Habitat Association

Class	Common Name/ Species
ANIMALS	
Birds	Sharp-shinned Hawk/ *Accipiter striatus*
	Acadian Flycatcher/ *Empidonax virescens*
	Wood Thrush/ *Hylocichla mustelina*
	Swainson's Warbler/ *Limnothlypis swainsonii*
	Red-breasted Nuthatch/ *Sitta canadensis*
PLANTS	
Liverworts	Liverwort/ *Nowellia curvifolia*
Monocots	Pink Lady's-slipper/ *Cypripedium acaule*
Mosses	Feather Moss or Log Moss/ *Hypnum curvifolium*
	Feather Moss or Log Moss / *Hypnum imponens*
	Fern Moss or Log Moss / *Thuidium delicatulum*

Attachment B.

White Pine-Hemlock Species/Habitat Relationships with References

ANIMALS

Birds

Sharp-shinned Hawk – *Accipiter striatus* – Although this species is known to use a mixture of hardwoods and conifers, pines and hemlock seem to be preferred for nesting and over-wintering in Kentucky. The typical nesting site is in the canopy of a large, mature pine or hemlock within an extensive tract of forest. Sharp-shinned hawks are also observed (e.g., when foraging) within areas having a mix of forested and semi-open habitat; however, they more frequently occupy heavily forested areas (Hamel, 1992). Thus, year-round, the existence of tracts of mature forest is of prime importance to the species.

Acadian Flycatcher – *Empidonax virescens* **–** This species is usually found near water, generally near a stream course or some small waterway (Hamel, 1992). It generally uses an open, moderate understory for feeding in a stand with tall trees and closed canopy (DeGraaf et. al., 1991). It is associated with forested tracts at least 37 hectares (91.4 acres) in size (Hamel, 1992). DBNF monitoring data indicates that the greatest number of occurrences for this species were in mesophytic-cove habitats greater than 80 years old. The acadian flycatcher is particularly fond of the shaded, moist coves dominated by hemlocks and adjacent to small streams (L.Perry, pers. obs.)

Wood Thrush – *Hylocichla mustelina* **–** The wood thrush is found in a wide variety of forest types, provided a well-developed understory is present. Moderately shaded, deciduous and mixed stands of mature trees with a dense shrub and/or sapling understory are typical habitat, particularly when occurring on moist sites. Rich hardwood and bottomland forests are favored; however, drier sites may be used, so long they have the relatively dense shrub layer. Nesting is in shrubs, vines, and small trees. Although the species will tolerate some fragmentation of habitat, it is most common in extensive forest and requires a minimum tract size of 3 hectares (Hamel 1992). This species would be particularly attracted to the white pine-hemlock forest due to the damp, shaded conditions frequently associated with it.

Swainson's Warbler – *Limnothlypis swainsonii* **–** This forest interior species is found within tracts of moist, extensive forest that have dense understory (Palmer-Ball, 1996). Hemlock ravines, having dense growths of rhododendron and laurel, and bottomland forest, with a well-developed understory and/or thickets of small trees, are favored locations. Dense cane breaks are also used. On the DBNF, this bird is often observed in damp, shady hemlock ravines with an understory of rhododendron, near small streams (L.Perry, pers. obs.).

Red-breasted Nuthatch – *Sitta canadensis* – Though this nuthatch is dependent on coniferous habitat, its requirements vary consider-ably between seasons. It generally breeds at elevations above 3500 feet, in dead spruce or fir trees. Occasionally it will nest in hemlock and, rarely, in pine. Suitable snags (dead trees) are greater than 6"dbh (six inch diameter at breast height). Mature stands are favored. The red-breasted nuthatch prefers to overwinter in dense stands of

conifers and pine-oak. During this time, the birds are not particular to age class so much as to stand density. On the DBNF, when these birds are encountered in winter, it is almost always while feeding in pines—especially mature virginia pines having a lot of cones (L. Perry, pers. obs.). The red-breasted nuthatch is particularly attracted to white pine forests during its nesting season, where it gathers white pine resin to smear on the face of its nest tree.

PLANTS

Liverworts

Liverwort – *Nowellia curvifolia* – This liverwort is widespread in northern North America, south into the Appalachian provinces, present in the high mountains of Mexico and Central America. It is found almost exclusively on decorticated logs. On the DBNF, it is found almost exclusively on decorticated eastern hemlock and yellow pine logs, usually of 10-12 inch diameter or larger. It requires moderate to heavy shade.

Monocots

Pink Lady's-slipper – *Cypripedium acaule* – Across its range, it occurs in acid forests or wetlands (usually sphagnum bogs). On the DBNF, pink lady's-slipper is found in upland oak and mixed pine-oak woods, and occasionally on hummocks within seeps and streamhead wetlands. It occurs in light to heavy shade, but does not seem to flower unless in somewhat open conditions. This species responds well to burning. It is not uncommon to find 3-4 dozen plants in flower and as many more in vegetation condition following a fire where only a dozen or so were found before. The species is experiencing collection pressure from root diggers. Digging of this species is not permitted on the DBNF.

Mosses

Feather Moss or Log Moss – *Hypnum curvifolium* – It has a wide distribution in North America. The species is uncommon to common and occurs in a variety of habitats. It is usually found in moderate to heavy shade under hardwood or hardwood-pine canopy. It frequently grows on downed logs from which it is increasingly stripped for the horticultural industry. It is also found on rocks and boulders and occasionally soils and tree bases. The habitat occupied on the DBNF is usually downed logs or rocks.

Feather Moss or Log Moss – *Hypnum imponens* – It has a wide distribution in North America. The species is common to abundant and occurs in a variety of habitats. It is usually found in moderate to heavy shade under hardwood or hardwood-pine canopy. It frequently grows on downed logs from which it is increasingly stripped for the horticultural industry. It is also found on rocks and boulders and occasionally soils and tree bases. The habitat occupied on the DBNF is usually downed logs or rocks.

Fern Moss or Log Moss – *Thuidium delicatulum* – This moss is a northern US and Canadian species which extends southward in the eastern US to the Gulf coast (and south to northern South America). It is a usually common species in its habitat, which is on moist soil, humus, rocks, or logs in forest or sometimes meadows or fields. On the DBNF, it is most common in mixed mesophytic forest on rocks, logs and soil, but is also found in dry-mesic forest, and rarely in

xeric forest. It also occurs on the DBNF in old fields and meadows, sometimes in ruderal areas. This species is widely collected for the horticultural industry and in some areas is becoming scarce.

References:

DeGraaf R.M., V.E. Scott, R.H. Hamre, L. Ernst, and S.H. Anderson. 1991. Forest and Rangeland Birds of the United States - Natural History and Habitat Use. USDA Agriculture Handbook 688. 625 pp.

Hamel, Paul B. 1992. Land Manager's Guide to Birds of the South. The Nature Conservancy, Southeastern Region, Chapel Hill, NC. 437 pp.

Palmer-Ball, B.L. 1996. The Kentucky Breeding Bird Atlas. The University Press of Kentucky, Lexington, KY. 372pp.

Perry, L. Wildlife Biologist. USDA Forest Service, Daniel Boone National Forest, Stearns Ranger District. Personal Observations.

Attachment C.

White Pine-Hemlock Association Matrix

Association	Habitat	Modifier	Class	Common/Species
1-W. Pine-Hemlock	W. Pine-Hemlock Forest	(blank)	P-MON	Pink Lady-slipper/ Cypripedium acaule
		Acidic Substrate	P-MOS	Fern Moss, Log Moss/ Thuidium delicatulum
		Closed Forest Canopy	BIRD	Acadian flycatcher/ Empidonax virescens
		Dense shrub understory		Swainson's Warbler/ Limnothlypis swainsonii
				Wood Thrush/ Hylocichla mustelina
		Downed Logs	P-MOS	Feather Moss, Log Moss/ Hypnum imponens
		Downed Logs (minimum size)	P-LIV	Liverwort/ Nowellia curvifolia
		Elevation (above 2300 ft)	BIRD	Red-breasted Nuthatch/ Sitta canadensis
		Forest Interior (Minimal Edge)		Swainson's Warbler/ Limnothlypis swainsonii
		High Shade		Swainson's Warbler/ Limnothlypis swainsonii
			P-MOS	Feather Moss, Log Moss/ Hypnum curvifolium
		Large Decadent Trees	BIRD	Sharp-shinned Hawk/ Accipter striatus
		Mature forest		Red-breasted Nuthatch/ Sitta canadensis
				Wood Thrush/ Hylocichla mustelina
		Mid-age Forest		Swainson's Warbler/ Limnothlypis swainsonii
		Moderate Shade		Wood Thrush/ Hylocichla mustelina
			P-MOS	Fern Moss, Log Moss/ Thuidium delicatulum
		Moist	BIRD	Swainson's Warbler/ Limnothlypis swainsonii
			P-MOS	Feather Moss, Log Moss/ Hypnum curvifolium
				Feather Moss, Log Moss/ Hypnum imponens
				Fern Moss, Log Moss/ Thuidium delicatulum
		Open Midstory/Understory	BIRD	Acadian flycatcher/ Empidonax virescens
		Rocky/Rocks	P-MOS	Fern Moss, Log Moss/ Thuidium delicatulum
		Snags > 6" dbh	BIRD	Red-breasted Nuthatch/ Sitta canadensis
		Tract Size (Area Sensitive)		Acadian flycatcher/ Empidonax virescens
				Swainson's Warbler/ Limnothlypis swainsonii
		Tree and Snags (Cavity Nesters)		Red-breasted Nuthatch/ Sitta canadensis
		Water (Distance Sensitive)		Acadian flycatcher/ Empidonax virescens